US Army Corps of Engineers®

SPECIAL PUBLIC NOTICE

MITIGATION GUIDELINES AND MONITORING REQUIREMENTS

LOS ANGELES DISTRICT

Location

These Mitigation Guidelines and Monitoring Requirements are being applied throughout the Los Angeles District (LAD) of the U.S. Army Corps of Engineers (Corps), which encompasses the State of Arizona and portions of California (see attached drawing), specifically San Diego County, Imperial County, Riverside County, San Bernardino County, Orange County, Los Angeles County, Ventura County, Santa Barbara County, the coastal slopes of San Luis Obispo County, eastward of the crest of the Sierra Nevada in Inyo County, eastward of the crest of the Sierra Nevada in Mono County to the Conway Summit, and the southern slopes of the Tehachapi Mountains in Kern County. If modifications occur to the LAD's boundaries in the future, these Mitigation Guidelines and Monitoring Requirements will apply to all areas within the revised LAD boundaries.

Overview

Corps and U.S. Environmental Protection Agency (EPA) regulations (33 CFR 320-330 and 40 CFR 230) authorize the Corps to require compensatory mitigation for unavoidable impacts to wetlands and other jurisdictional "waters of the U.S." The Corps is aware of problems with past compensatory mitigation sites and is committed to improving the success of future compensatory mitigation projects. These Mitigation Guidelines and Monitoring Requirements are designed to assist the regulated public with all aspects of the mitigation process and to provide information to ensure future compensatory mitigation sites successfully replace all lost functions and values associated with regulated impacts to waters of the U.S.

The Corps LAD solicited comments on proposed revisions to the 1993 Habitat Mitigation and Monitoring Guidelines in August 1997 and November 2001. All comments were reviewed and considered to prepare these Mitigation Guidelines and Monitoring Requirements, which the Corps LAD is implementing with this Special Public Notice dated **January 27, 2003**. These Mitigation Guidelines and Monitoring Requirements are to be applied by the regulated public and by Regulatory Branch Project Managers for activities within the LAD. The rationale is that these Mitigation Guidelines and Monitoring Requirements, developed from previous guidelines, experience, field investigations, and public input, provide the next step in the process of improving the success of compensatory mitigation projects in the LAD.

I. INTRODUCTION

A. PURPOSE

These Mitigation Guidelines and Monitoring Requirements provide the approach the regulated public will follow in examining mitigation for project impacts, guidance on preparing compensatory mitigation and monitoring plans for unavoidable impacts to the aquatic environment including development of performance standards and final success criteria, and the elements required to prepare monitoring reports for compensatory mitigation sites. This document is divided into two parts to address the difference between Mitigation Guidelines and Monitoring Requirements.

The Mitigation Guidelines (Section II) have been prepared using previous versions of the Corps LAD's Mitigation and Monitoring Guidelines, published scientific data, and staff experience, including lessons learned from functional assessments of previous compensatory mitigation sites. This information is intended to assist the regulated public in preparing adequate compensatory mitigation and monitoring plans and in implementing successful compensatory mitigation projects.

The second part of the document (Section III) focuses on Monitoring Requirements. Monitoring reports will be submitted to the Corps in all cases where the Corps requires the construction of compensatory mitigation projects. A well-conceived and executed monitoring program is essential to identifying and remedying problems that can reduce the success of compensatory mitigation projects. All compensatory mitigation projects will be subject to compliance inspections by Corps LAD Project Managers.

The Corps LAD notes that particular applicants, such as the Port of Los Angeles and the Port of Long Beach, already have in place agency-approved programs to mitigate deepwater and shallow-water impacts associated with their activities. Therefore, unless their activities in waters of the U.S. adversely affect special aquatic sites (defined in 40 CFR 230, Subpart E), these Mitigation Guidelines and Monitoring Requirements are not applicable to their activities.

B. MITIGATION POLICY

The Corps and the EPA formulated policy and procedures to be used in determining the mitigation necessary to demonstrate compliance with the Clean Water Act Section 404(b)(1) Guidelines (40 CFR 230) (the Section 404(b)(1) Guidelines). This information is set forth in the "Memorandum of Agreement (MOA) Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines," dated February 7, 1990 (the Mitigation MOA).

The Section 404(b)(1) Guidelines limit the issuance of a permit to the activity or project design representing the least environmentally damaging practicable alternative (LEDPA) that is not contrary to the public interest. More specifically, the Section 404(b)(1) Guidelines state that no discharge of dredged or fill material shall be permitted if there is a practicable alternative available to the proposed discharge that would have less adverse impact on the aquatic ecosystem, if the alternative does not have other significant adverse environmental consequences. Practicability is defined in terms of cost, logistics, and existing technology in light of the overall project purpose. The burden to demonstrate compliance with the Section 404(b)(1) Guidelines rests with the permit applicant. For non-water dependent discharges into special aquatic sites, there is a presumption that less environmentally damaging practicable alternatives are available. If the applicant has complied with the Guidelines by first evaluating alternatives that would avoid impacts, and then taken appropriate and practicable steps to minimize adverse impacts to the maximum extent practicable, then compensatory mitigation is required for the unavoidable impacts.

Even in cases where a Corps-notifying General Permit (Nationwide Permit or Regional General Permit pursuant to 33 CFR 330) applies, the applicant will have to demonstrate avoidance and minimization of aquatic resource impacts. Granted, the demonstration required is typically less rigorous than for a Standard Permit. Nevertheless, if an applicant is required to notify the Corps regarding authorization under an existing General Permit, it is likely that the Corps LAD's verification letter/notice to proceed will require compensatory mitigation. Clearly, the sequence of avoidance, minimization, and compensatory mitigation specified by the Section 404(b)(1) Guidelines and the Mitigation MOA is fundamental to the administration of the Corps' regulatory program.

C. CORPS POLICY

As stated in the Mitigation MOA, the goal of the Clean Water Act and the Section 404(b)(1) Guidelines is to maintain and to restore the physical, chemical, and biological integrity of the Nation's waters. The Corps strives to avoid or minimize adverse impacts to waters of the U.S., and to achieve a goal of no net loss of wetland functions and values. To achieve these goals, compensatory mitigation is generally required at a minimum 1:1 replacement ratio. In the past, the Corps has accepted acreage as a surrogate for functions and values because the former parameter is easier to measure. The proliferation of habitat assessment tools in recent years has allowed the Corps to utilize estimates of functions and values increasingly to determine replacement ratios. The replacement or mitigation ratio is often increased in consideration of a number of factors, including the scarcity and quality of the habitat to be impacted in consideration of the region or watershed, any temporal loss of aquatic habitat functions and values caused by a delay in the construction of a compensatory mitigation site, the cumulative effects of that portion of the project in the Corps' scope of analysis in the context of past and reasonably foreseeable projects in the region or watershed, the use of a long-term irrigation strategy as a replacement for natural hydrologic processes, and the inclusion of an adequate margin of safety to reflect the expected degree of success associated with the compensatory mitigation plan.

Even with a margin of safety, compensatory mitigation often does not replace all functions and values lost at the impact site. A recent study of Orange County compensatory mitigation sites by Sudol (1996) suggested that many past mitigation sites have not been successful, when measured by permit compliance or by estimating the capacity of the riverine habitat at these sites to perform functions compared to relatively undisturbed riverine habitat in the region. This study determined that many compensatory mitigation sites lack natural hydrology, which reduces their capacity to perform a range of functions expected for the type of habitat being mitigated. Results from this and several other studies as well as the experience of regulators throughout the U.S. underscore the importance of including an adequate margin of safety in determining the replacement ratio. The margin of safety included by the Corps LAD can be reduced by completing compensatory mitigation in advance of or concurrently with the impact, demonstrating the success of past compensatory mitigation sites, showing that the proposed compensatory mitigation will result in more overall benefit to the region or watershed to which the proposed impact site contributes, and ensuring that the compensatory mitigation sites are protected from subsequent loss or degradation (e.g., inclusion of permanent vegetated buffers around the site).

The Corps recognizes that on-site compensatory mitigation is not always practicable or "best" for the aquatic resources. In many cases, sites elsewhere in the region or watershed offer higher potential gains in functions and values. During the last decade, the Corps has become more involved in watershed studies, which identify and evaluate a watershed's resources and stakeholder interests to improve basin-wide decision-making. The Corps' Regulatory Branch is striving to transition from the historic paradigm of "piece-meal" or project-by-project permitting and mitigation decisions to a system-oriented or holistic approach. Toward this end, the Corps has become more involved in working with the public to develop mitigation banks and in-lieu fee mitigation programs, which offer means of compensating for individual project impacts on a larger scale. The Corps favors the use of approved mitigation banks or in-lieu fee programs in cases where they result in more regional or watershed benefit than on-site compensatory mitigation.

The applicant should contact the Corps as early in the project development process as possible. The Corps encourages all applicants to hold pre-application meetings with the Corps and other resource agency representatives. During these meetings, the Corps and the resource agencies can evaluate preliminary project designs and discuss mitigation opportunities. The applicant should never purchase sites or finalize plans before the Corps has reviewed and approved of the compensatory mitigation concept. It is important to note that payments made prior to the Corps permit decision are generally considered "sunk" costs, and regulatory guidance requires Corps Project Managers exclude these costs in the evaluation of the practicability of a project or the associated compensatory mitigation plan. Likewise, payments by developers to an Assessment District, which can be based on assumptions of the number of housing units per area, to facilitate construction of schools, roads, and other infrastructure are generally treated by the Corps as "sunk" costs in evaluating practicability of project alternatives. These assumptions are speculative and are often determined without consulting with the regulatory agencies to determine if they are permittable in consideration of the environmental resources potentially present.

Compensatory mitigation will be required for most Corps authorizations. For Standard Permit applications, the applicant should submit a **conceptual** mitigation plan along with the formal application materials. This plan should focus on discussing the mitigation concept(s); not providing a fully developed mitigation and monitoring plan with implementation, maintenance, and monitoring protocols. It should include a summary of how on-site impacts would be avoided and minimized, and why the applicant believes that the remaining, proposed impacts would be adequately compensated. Generally, a fully developed **draft** compensatory mitigation and monitoring plan should not be prepared until the Corps has accepted a final jurisdictional map, which must also identify project impacts, and has agreed that the conceptual mitigation plan would likely compensate for the proposed impacts. At this juncture, the Corps will typically discuss with one or more of the resource agencies the likely efficacy of the proposed compensatory mitigation. In general, the **final** compensatory mitigation and monitoring plan should not be submitted until after public comment period closes and the Corps has made a preliminary determination of compliance with the Section 404(b)(1) Guidelines. For Letters of Permission, the Corps may or may not require compensatory mitigation; the Corps should be contacted prior to the submittal of an application to determine if compensatory mitigation would likely be required. If an applicant requests verification of a project's authorization under an existing Nationwide Permit or a Regional General Permit, and proposes compensatory mitigation, a **draft** compensatory mitigation and monitoring plan must be submitted with the request for verification. The applicant should contact the Corps LAD as soon a possible to ascertain whether compensatory mitigation will be required.

The **final** submittal of a compensatory mitigation and monitoring plan should be in a **SINGLE** document. It should contain up-to-date versions of all materials, even if other versions were submitted earlier in the application process. It should include the preparer’s identity (if not the applicant) and the date of the final submission.

D. COMPLIANCE ASSURANCES

An applicant may be required to provide a letter of credit, performance bond, or other special funding to ensure attainment of the approved compensatory mitigation project success criteria stated or referenced in the Corps LAD’s permit conditions. The monetary value of the letter of credit or performance bond will be determined by the Corps, based on an estimate of the total cost of the proposed compensatory mitigation project provided by the applicant. The amount of the bond may also depend on the use of irrigation on the proposed site in-perpetuity or any time delay between the project-related impacts and the construction of the compensatory mitigation site. The Corps typically adds 20% (as a contingency) to the estimate of the total cost of the compensatory mitigation, which is the amount actually insured by the holder or surety of the performance bond or letter of credit. The Corps can add a higher percentage contingency, if the applicant has had a history of failed or incomplete compensatory mitigation projects. The estimate of the cost of the compensatory mitigation project shall include, at a minimum, the costs associated with site preparation (including grading), vegetation acquisition and installation, irrigation installation and operation, all maintenance and monitoring efforts, contingency measures, and monitoring reports. This total cost estimate is a required part of any compensatory mitigation and monitoring plan, regardless of whether a performance bond, letter of credit, or other special funding is required.

E. PROTECTION OF COMPENSATORY MITIGATION SITES

In many cases, the Corps has required in-perpetuity protection of compensatory mitigation sites. The decision regarding whether to require in-perpetuity protection has been based on several factors, such as the quantity and quality of the resources at the impact site and the compensatory mitigation site, and their importance to the region or watershed. Regulatory Guidance Letter 01-1, issued October 31, 2001, encourages in-perpetuity protection for compensatory mitigation sites. The Corps LAD will continue to require in-perpetuity protection for most compensatory mitigation sites. In-perpetuity protection typically occurs through the recordation of a Conservation Easement or a Deed Restriction, or in unusual cases, the recordation of a development's Covenants, Codes, and Restrictions. The Corps LAD has a template Conservation Easement and a template Deed Restriction, which are to be used when either a Conservation Easement or a Deed Restriction, respectively, is required.

F. PERSONS TO CONTACT WITH QUESTIONS

For answers to questions regarding the interpretation of these Mitigation Guidelines and Monitoring Requirements or acceptable compensatory mitigation for a specific project, contact the Corps LAD Project Manager responsible for your area of interest:

Los Angeles District Office	(213) 452-3407/3409
Ventura Field Office	(805) 585-2140
San Diego Field Office	(858) 674-5387
Phoenix Field Office	(602) 640-5385
Redlands Field Office	(909) 794-7704
Tucson Field Office	(520) 584-4486

The Corps LAD Regulatory Branch website also provides important information regarding Corps jurisdiction, processing of permit applications, and mitigation: (http://www.spl.usace.army.mil/regulatory/)

II. MITIGATION GUIDELINES

After the applicant has demonstrated maximum avoidance and minimization of project impacts to waters of the U.S., the Corps LAD will likely require compensatory mitigation for the unavoidable impacts. There are often many options for providing compensatory mitigation, but the applicant should investigate and consider Corps-approved mitigation banks and in-lieu fee programs serving the area where the proposed impacts would occur. On-site compensatory mitigation could be impracticable, if the established, restored, enhanced, and/or preserved habitat would be isolated, of small acreage, or experience substantial changes in hydrologic condition over the long term. With many Corps-approved mitigation banks and in-lieu fee mitigation programs, the responsible entity (e.g., conservancy) has analyzed the type(s) of habitat and location(s) that would benefit the region or watershed(s) within the bank or program's service area. In these cases, the purchase of mitigation credits in existing banks or the payment of in-lieu fees could provide a more practicable option, which could also enhance the regional or watershed's aquatic resources. However, the Corps will make the final decision whether to accept purchase of credits from a Corps-approved mitigation bank or in-lieu fee mitigation program, after examination of all relevant habitat considerations, including landscape-level issues, such as wildlife corridors and water quality.

The compensatory mitigation will proceed through several stages, if satisfying the requirement involves the construction of a compensatory mitigation project. In these cases, there are specific issues the applicant must address at each stage in the process, to increase the probability of a successful compensatory mitigation project. The key stages in the development of a compensatory mitigation project are:

A. Project Site Impact Assessment

B. Compensatory Mitigation Site Selection

C. Compensatory Mitigation Site Design

D. Compensatory Mitigation Site Construction

E. Long-Term Compensatory Mitigation Site Maintenance and Monitoring

Within each of these areas, the Corps has identified specific concerns that the applicant needs to consider in developing an adequate compensatory mitigation and monitoring plan. The Corps LAD **strongly recommends** that all applicants follow the outline provided at the end of Section C. when preparing draft and final compensatory mitigation and monitoring plans.

A. Project Site Impact Assessment.

1. An important aspect of any permit application is the assessment of the project site before impacts occur. An adequate assessment of the current functions and values before the construction of the project is important for determining the relative importance of the aquatic resources to the site and to the region or watershed.

Assessment results can provide a basis for modifying pre-construction plans to avoid and/or minimize impacts to these resources. This assessment should be completed before the proposed project is designed or the proposed compensatory mitigation site is selected.

The applicant will choose the site assessment method. One acceptable method, the Hydrogeomorphic (HGM) Approach, can be used to estimate the capacity of wetlands and other waters of the U.S. to perform specific functions relative to similar types of waters in the region (Smith *et al*., 1995). In 1997, the Corps, EPA, U.S. Fish and Wildlife Service, Natural Resources Conservation Service, and Federal Highway Administration published the *National Action Plan to Implement the Hydrogeomorphic Approach to Assessing Wetland Functions*, which detailed an ambitious strategy for implementing this method nationwide. The HGM Approach is based on the HGM classification system (Brinson, 1993), which categorized the nation's wetlands and other waters of the U.S. into seven classes, based on fundamental differences in hydrology, hydrodynamics, and geomorphology. During the last several years, the Corps' Waterways Experiment Station (WES) has been developing National HGM Guidebooks, which provide template models for assessing the capacity of each of the seven identified classes to perform their characteristic functions. However, regional differences require that these Guidebooks be modified to reflect the conditions occurring in the region of interest. The data generated from applying these Regional HGM Guidebooks can be used to identify appropriate compensatory mitigation ratios for project impacts (Rheinhardt *et al*., 1997).

The HGM Approach is used to evaluate the aquatic habitat in question by scoring a suite of recognizable functions that have been determined to classify the particular wetland or water of the U.S. (Brinson *et al.*, 1995; Smith *et al.*, 1995). These functions are divided into three general subgroups: Hydrology, Biochemistry, and Habitat. Within each subgroup, there are a number of functions that characterize the aquatic habitat. Each of these functions is defined by evaluating one or more variables or ecosystem/landscape attributes that are measured or estimated by measurement of direct or indirect indicators in the field. Each variable is evaluated in the field by either qualitative or quantitative methods and is typically assigned a value between 0 and 1, with 0 representing lack of the indicator with no potential for recovery and 1 representing the highest sustainable indicator level. Each function is evaluated using a pre-derived algorithm or mathematical relationship of one or more variables. Each functional algorithm is developed to produce a functional capacity index (FCI) score ranging from 0 to 1. An FCI score of 1 represents the "highest sustainable" functioning for the region, whereas an FCI score of 0 corresponds to lack of function with no opportunity for recovery under natural conditions.

After the numeric values for each of the functions are determined, these FCI scores (unitless) are multiplied by the acres of habitat proposed for impact to determine the Functional Capacity Units (FCUs) occurring at the impact site. The FCUs provide a direct indication of the minimum compensatory mitigation required if the project proceeds as proposed. The Corps can increase this total to account for landscape or regional functions, values provided by the site/ecosystem functions, the timing of the impact relative to the implementation and maturation of the compensatory mitigation, and any factors that could reduce the likelihood of compensatory mitigation success. At this point, the applicant should carefully consider the cost of providing compensatory mitigation in comparison with the cost of avoiding or minimizing impacts from the proposed project.

While the HGM Approach offers a promising tool for evaluating wetlands and non-wetland waters of the U.S., few Regional HGM Guidebooks are currently available for evaluating aquatic habitat in the LAD. Two draft Regional HGM Guidebooks are available for assessing riverine wetlands/waters in the Santa Margarita watershed (Lee *et al*., 1997) and the south coast region of Santa Barbara County (Lee *et al*., 2001). Both offer useful frameworks for estimating the capacity of riverine habitat in their respective reference domains to perform functions. However, neither Guidebook has been finalized, and neither one should be used in its current form, unless the Corps approves its use in a particular case. The Corps hopes that these Guidebooks and others capable of evaluating other classes (e.g., depression, slope, lacustrine fringe, estuarine fringe) of habitat in the LAD will be completed in the near future.

B. Compensatory Mitigation Site Selection

1. The selection of an appropriate site upon which to construct a compensatory mitigation project has been one of the most neglected aspects of compensatory mitigation planning. In the past, many applicants have relied on project economics to choose compensatory mitigation sites, without considering the underlying physical characteristics. In all wetland/waters compensatory mitigation projects, hydrology is the most important consideration. In a recent study of riparian compensatory mitigation sites in Orange County, California, the presence of a natural source of water (e.g., stream channel or lake) was determined to be crucial to the capacity of compensatory mitigation projects to function (Sudol, 1996). According to this study, sites primarily supported by long-term irrigation (e.g., drip irrigation, wide spray, or intermittent flooding of the site) are deficient in several respects. First, long-term irrigation does not provide the dynamic and variable nature of water flow normally found in southern California riparian systems. Periodic scour of vegetation, deposition of sediment, and re-colonization by vegetation, are severely restricted in these cases, which are processes fundamental to the development of these areas. Without re-colonization, the aquatic habitat would probably not survive any large stress or perturbation. Second, the lack of seasonal flows limits the transport of organic matter into and out of the riparian habitat. Without any inflow, the net result of long-term irrigation is the transport of organic material out of the compensatory mitigation site. Third, the use of flood or spray irrigation systems on newly cleared land promotes the germination and growth of non-native, invasive plant species. Several of these invasive species are capable of out-competing most understory and herbaceous plants, while one particularly problematic species in southern California, giant reed (*Arundo donax*), can displace existing trees and shrubs. Fourth, the lack of a natural stream channel at many of these sites reduces one of the most important functions of riparian habitat: its role as a corridor used by many mammals, birds, and reptiles.

The National Research Council's *Compensating for Wetland Losses Under the Clean Water Act* (2001) stated that hydrological conditions, including **variability** in water levels and flow rates, are the primary driving force influencing wetland development, structure, functioning, and persistence. Without a naturally variable source of water (e.g., stream, lake, tidal action), many of the hydrologic functions or processes will occur at low levels throughout the life of the habitat. Lack of a natural water source or hydrological equivalence between the impact site and the compensatory mitigation site has been the number one physical factor leading to the low rate of success of past compensatory mitigation projects.

Because compensatory mitigation sites primarily supported by long-term irrigation tend to be less successful, the Corps **strongly** discourages the use of long-term irrigation as the main water source. Short-term (i.e., 1-3 years) irrigation sufficient to establish plant roots is not discouraged and is, in some cases (e.g., desert areas), essential. The guidelines published for the establishment of mitigation banks provide specific instruction on this issue. The mitigation banking guidelines state:

> "In general, (mitigation) banks which involve complex hydraulic engineering features and/or questionable water sources (e.g. pumped) are most costly to develop, operate and maintain, and have a higher risk of failure than banks designed to function with little or no human intervention. The former situations should only be considered where there are adequate assurances to ensure success. This guidance recognizes that in some circumstances wetlands must be actively managed to ensure their viability and sustainability. Furthermore, long-term maintenance requirements may be necessary and appropriate in some cases (e.g., to maintain fire-dependent plant communities in the absence of natural fires; to control invasive exotic plant species).
>
> Proposed mitigation techniques should be well-understood and reliable. When uncertainties surrounding the technical feasibility of a proposed mitigation technique exist, appropriate arrangements (e.g., financial assurances, contingency plans, additional monitoring) should be in place to increase the likelihood of success. Such arrangements may be phased out or reduced once the attainment of prescribed performance standards is demonstrated."

The Corps LAD is not prohibiting compensatory mitigation primarily supported by long-term irrigation, but much less compensatory mitigation credit will be given for sites with long-term dependence on artificial sources. Therefore, applicants should weigh the potential investment costs of acquiring suitable land adjacent to existing channels, lakes, or other natural water feature for restoration or enhancement relative to establishment projects in upland environments, which will likely involve higher costs (considering the additional mitigation and the risk of failing to meet the Corps' success criteria). In addition, it is likely that the applicant will be required to provide assurance (in the form of a performance bond or an irrevocable letter of credit) of **perpetual** maintenance and water supply, if the Corps is asked to accept artificially irrigated sites as compensatory mitigation. Applicants should carefully consider expanding efforts to avoid and minimize on-site impacts and to attempt to submit plans for self-sustaining compensatory mitigation sites along natural water features, such as stream channels.

2. Site selection should include and prioritize the following criteria, which relate to aspects of the physical environment:

a. *Natural Hydrology*. Natural hydrology can be exceedingly difficult to establish. The successful determination of proper hydrology will require analysis of existing conditions in reference sites and hydrologic testing of the possible compensatory mitigation sites. This testing should include an examination of the groundwater availability, frequency of flooding, depth/duration/timing of flooding, and determination of tidal ranges in estuarine and marine areas. Modification of hydrologic characteristics should be kept to a minimum with the stated goal to have the site be hydrologically and hydraulically self-sustaining and require little or no long-term maintenance. If the goal is to establish wetland habitat, the net inflows must by definition, exceed the net outflows. A reliable estimate of the water budget for the site is essential.

b. *Wildlife Corridors*. The goal is development of compensatory mitigation projects adjacent to existing high-functioning habitats. Even more desirable would be the construction of a compensatory mitigation site that links two or more habitats, which had been previously separated. The use of spatial analysis tools (GIS) on a regional basis could provide valuable assistance in the choice of preferable locations for compensatory mitigation sites. The distance to the nearest area of native vegetation that forms a contiguous link to larger habitat complexes would be an important consideration in the width of the corridor, the value of the habitat to the local wildlife, and it would affect the final mitigation ratio.

c. *Soil Characteristics*. Most of the past compensatory mitigation projects did not address the development of suitable soils. This neglect is somewhat understandable, due to the varied nature of soils and the past emphasis on non-wetland compensatory mitigation. Examination of existing reference sites will provide important information on the development of suitable soils for future sites. It is also critical to understand that the development of suitable soils is linked to the establishment of natural hydrology. In sites with long-term irrigation as the primary source of hydrology, the placement of large amounts of relatively clean water onto the site results in the net removal of organic material without replacement. This would slow the development of organic soils, which has been noted in several compensatory mitigation sites. If a goal of the compensatory mitigation project is wetland development, organic material will be necessary to foster the development of hydric soil indicators. Mycorrhizal soil injections should be considered in some cases, particularly where establishment projects are attempted in areas without appropriate soil conditions. In the case of in-kind compensatory mitigation for wetlands, soils from the impacted aquatic habitat should be collected and used at the compensatory mitigation site. It is also essential that soils at the compensatory mitigation site not be excessively compacted; excessive compaction can drastically limit plant growth. In some cases, it might be necessary to rip or scarify the soil after cessation of grading activities.

If a Regional HGM Guidebook is available to assess a particular habitat type, it would be possible to compare or rank compensatory mitigation sites/projects for that habitat type using the Guidebook's variables/functions related to these physical characteristics. The physical characteristics of the site generally are set relatively early in the process and would not change dramatically over time. Comparison of the ranking of specific variables (and in some cases, FCI scores) among candidate sites with the impacts at the project site would provide a valuable preliminary indication of the possible success and cost of compensatory mitigation at each of the sites. For example, if a proposed compensatory mitigation site could be easily restored to high functional capacity for several hydrologic functions, the probability of success for this site would be higher than for a site having a low likelihood for restoration to low functional capacity for these same functions.

3. Generally, the physical characteristics of the sites considered determine whether establishment (i.e., creation), restoration, enhancement, or, more rarely, preservation are viable compensatory mitigation options. The categories of compensatory mitigation, as defined by Lewis (1990) are:

Restoration:	return to a pre-existing condition.
Creation:	conversion of a persistent non-wetland habitat into wetland (or other aquatic) habitat. Two subdivisions are recognized: Artificial (i.e., irrigation required) or self-sustaining.
Enhancement:	increase in one or more functions due to intentional activities (e.g., plantings, removal of non-native vegetation).
Passive Re-vegetation:	allow a disturbed area to naturally re-vegetate without plantings.

Regulatory Guidance Letter 01-1 used the term establishment instead of creation. The former term will be used in this document for consistency with this Corps Headquarters' guidance. Establishment projects have the greatest potential because, in theory, the full suite of functions performed by that habitat type are established; but they also have the highest risks. Establishing aquatic habitat in an area where it did not previously exist is a difficult proposition. Restoration projects have had a higher degree of success in the Los Angeles District. Despite the uncertainties associated with establishment projects, the Corps usually recognizes establishment and restoration equally when it comes to determining compensatory mitigation credit. Enhancement projects generally receive less compensatory mitigation credit, because enhancement targets particular functions instead of the full suite of functions performed by that habitat type. When enhancement is accepted, the Corps will require that the enhancement improve as many of the functions as possible. Preservation as compensatory mitigation is rarely accepted, unless it is combined with restoration, enhancement, or establishment projects sufficient to ensure “no net loss” of functions and values. Preservation is essentially avoidance, which is required under the Mitigation MOA and the Section 404(b)(1) Guidelines. Preservation is accepted on occasion, when particularly rare or valuable aquatic habitat is threatened by anthropogenic activities. An example was the establishment of the Barry Jones Wetland Mitigation Bank, near the City of Temecula, in Riverside County, California. The preserved habitat is a large (33 acre vernal pool with approximately 99% or 110 acres of its contributing watershed), intact vernal pool under imminent threat of development. Its regional importance and the threats to it were the primary reasons the Corps approved this mitigation bank. To ensure “no net loss” of habitat, applicants wishing to purchase credits at this mitigation bank must still provide 1:1 compensatory mitigation onsite (or as nearby as practicable) for their impacts.

C. Compensatory Mitigation Site Design

1. Design of the compensatory mitigation project is highly dependent on the site selected. As discussed in the previous section, interaction with a natural source of hydrology is essential to the development of a high-functioning, sustainable compensatory mitigation site. Therefore, the design should focus on ensuring this interaction emulates what is occurring at reference (i.e., high-functioning) sites for the target habitat type(s). The factors used in the preliminary design of the compensatory mitigation site should have a **functional** assessment basis. If the HGM Approach is used, the applicable Regional HGM Guidebook will provide most of the critical elements (system attributes or variables and functions) that need to be addressed for that habitat type in the compensatory mitigation plan. If the variables or functions are included in the design, it will be much easier to develop success criteria for the final compensatory mitigation project. As noted earlier, however, there are currently few Regional HGM Guidebooks available for assessing wetlands and other aquatic habitat in the LAD.

2. There are several important features to any successful compensatory mitigation design or plan. Each aspect of the plan must be identified in detail and explained clearly. Although there may be variation in the number of items required for a particular plan, those identified below should be assumed to be the **minimum**. When preparing a draft or final compensatory mitigation and monitoring plan, the Corps LAD **strongly recommends** that the regulated public follow the format provided at end of Section C., which is an updated version of the annotated outline provided in the 1993 Habitat Mitigation and Monitoring Guidelines. This format has proven to be useful to the regulated public and to the Corps LAD during the past decade.

a. *Clearly define the purpose of the compensatory mitigation project*. Evaluation of past compensatory mitigation and monitoring plans shows that the purpose of the planned compensatory mitigation project has frequently not been included in the description. Usually, there has been a vaguely worded statement about restoration of habitat on the compensatory mitigation site. The purpose of the compensatory mitigation project must be **clearly** identified and include specific statements about the type(s) of habitat (and associated functions and values) to be impacted by the construction project, the functions and values that would be replaced at the proposed compensatory mitigation site, and any other functions and/or values that are desired (e.g., habitat for federally listed threatened or endangered species). Clearly written purpose statements will provide important information for the development of useful performance standards and success criteria and the approval of the compensatory mitigation and monitoring plan.

b. *Develop a comprehensive hydrology component*. This component should include information about any existing channels, historic flow rates, surface and groundwater level fluctuations, tidal regimes (if relevant), and topography of the compensatory mitigation site (i.e., before and after any proposed grading). Clearly identify the source(s), quality, and quantity of water including temporal aspects of any irrigation plan, which may be required in the first few years (i.e., short-term irrigation) of implementing the compensatory mitigation to foster vegetation establishment. Provide information about the average amount of water and the variability of this water available to the site during a standard year. If available, include information on the depth of the water table and its variability throughout the year. Project success depends on having sufficient knowledge about the depth, duration, and timing of water delivery to the compensatory mitigation site – will the water budget at the site support the intended habitat type(s)? This issue is especially important if wetland development is a goal.

c. *Develop a complete grading plan making use of the hydrology data*. Evaluate the grading plan for possible areas of scour and/or deposition of sediment. In many aquatic areas, such as riverine systems, scour and deposition are fundamental and dynamic processes and should not be precluded. However, it would be illogical to plant areas that are actively scoured or filled, such as an active stream channel. Modify the grading plan as necessary to establish areas for planting that are progressively less subject to regular scour (i.e., higher terraces or elevations) and deposition (use adjacent, less-disturbed habitat as a reference). For riverine habitat, secondary or higher-flow channels can also be excavated on terraces closer to the active channel. Riley (1998) provides an outstanding reference for stream-design criteria (e.g., channel width/depth, stream sinuosity). For estuarine marsh compensatory mitigation sites, changes in sea level (e.g., global warming) and subsidence (e.g., metabolism of soil organic matter) are key considerations for the long-term development and success of these sites. For vernal pools, the elevations within the pool are critical, and the grading plans should depict no coarser than 0.5-foot contours. For all habitat types, plenty of micro- and macrotopographic variation should be incorporated into the design and specified in the grading plan; this variation is important to maximizing habitat variability. Again, examine adjacent or nearby less-disturbed habitat as a reference.

d. *Determine the Adequacy of the Soils to Support the Target Habitat Types*. Identify the soil type(s) onsite before and after grading. If development of jurisdictional wetlands is a goal, it is important to consider whether the soils are of the appropriate texture to support wetlands. Does the NRCS Soil Survey indicate that hydric soils occur at the site, or that hydric soil inclusions can occur in the soil type(s)? If not, addition of clay or silt might be necessary to reduce the soil's permeability. Determine whether other soil amendments will be necessary for long-term habitat development (e.g., organic matter, nitrogen, etc.). If amendments will be required, determine the most efficacious methods of nutrient delivery over the long-term.

e. *Develop a draft plant palette based on the compensatory mitigation project purpose, soil types, and hydrology*. Identify tree, shrub, and herbaceous species to be planted, the source of the material, and the number and size of individual plants. Plant stock should be obtained from areas as near to the compensatory mitigation site as possible, to preserve the genetic integrity of the area. Plant understory species during the initial site planting (typical) or at a later date when the canopy cover has reached a specified level. If the understory is planted later (atypical), it might be necessary to fell a few trees to create openings in the canopy for these new plants to survive. The Corps strongly recommends that felled trees remain at the mitigation site (along the ground) to serve as a source of decaying coarse woody debris, which is important to systemic nutrient cycling. Vegetation should be planted in clusters and islands that emulate regional reference (i.e., high-functioning) sites; they should not be planted in rows and spaced at regular distances. The Corps can assist applicants in identifying suitable regional reference sites.

In addition to plant types, the proposed irrigation strategy should consider soil type(s), hydrology, and other relevant factors. Develop a plan to wean plants from irrigation (if irrigation is required to establish plants) and a monitoring scheme to maintain plant hydration. Examine the possibility of mixing lower-cost plant material (cutting of local plants) with a small number of larger container stock to develop vertical heterogeneity (strata). These recommendations are designed to avoid the establishment of tree farms (e.g., large numbers of same-age trees planted in regular rows on six-foot centers).

f. *Propose realistic success criteria based on the purpose of the compensatory mitigation, design of the site, and functional assessment criteria*. Develop measurable success criteria, consistent with the purpose and goals of the compensatory mitigation project, that are achievable by the end of the maintenance and monitoring period (**generally** five years after compensatory mitigation implementation, but longer periods may be required). Include measurable and realistic performance standards and what methods will be used to track progress toward achieving the approved success criteria. Commonly used success criteria in compensatory mitigation projects have included percent canopy cover, percent plant survival, percent of distinct species that are native, percent canopy cover of non-native species, plant heights, and occurrence/nesting of target wildlife species. During the last few years, functional assessment criteria, such as HGM variables and functional algorithms, have been used in the LAD to evaluate compensatory mitigation progress and success. These criteria, when available, provide a reliable and objective means of evaluating the capacity of the area to perform ecosystem functions. **Development of appropriate success criteria is the single most important element in the development of a successful compensatory mitigation and monitoring program.** Involve the Corps as early as possible to develop specific, measurable performance standards (to track progress during the maintenance and monitoring period) and success criteria.

g. Develop a Specific Maintenance and Monitoring Program Including Contingency Measures. Detail how often and when the compensatory mitigation site will be monitored and by whom, and the dates that monitoring reports will be provided to the Corps LAD. Also provide specifics regarding the type and timing of maintenance activities at the compensatory mitigation site and the responsible parties. Describe the conditions that would necessitate the responsible parties to undertake contingency measures, and what sources of funding and alternate compensatory mitigation sites are available to ensure the required compensatory mitigation occurs successfully.

Recommended Outline for Draft and Final Compensatory Mitigation and Monitoring Plans (Updated from the 1993 Habitat Mitigation and Monitoring Guidelines):

DESCRIPTION OF THE PROJECT/IMPACT SITE
1. Responsible Parties
2. Location of Project (include Latitude/Longitude or UTM Coordinates)
3. Brief Summary of Overall Project
4. Jurisdictional Areas to be Filled By Habitat Type
5. Type(s), Functions, and Values of the Jurisdictional Areas To Be Directly and Indirectly Impacted

GOAL(S) OF THE COMPENSATORY MITIGATION PROJECT
1. Type(s) and Area(s) of Habitat to be Established, Restored, Enhanced, and/or Preserved
2. **Specific** Functions and Values of Habitat Type(s) to be Established, Restored, Enhanced, and/or Preserved
3. Time Lapse Between Jurisdictional Impacts and Expected Compensatory Mitigation Success
4. Estimated Total Cost (including all compensatory mitigation site preparation, planting, maintenance, and monitoring)
5. Special Aquatic Habitats, Other Waters of the U.S., and Non-Jurisdictional Areas Proposed as Compensatory Mitigation

DESCRIPTION OF THE PROPOSED COMPENSATORY MITIGATION SITE
1. Location and Size of Compensatory Mitigation Site (include Latitude/Longitude or UTM Coordinates)
2. Ownership Status
3. Existing Functions and Values of the Compensatory Mitigation Site (the baseline condition of the area proposed for compensatory mitigation, regardless of whether the area is jurisdictional or non-jurisdictional)
4. Jurisdictional Delineation (if applicable)
5. Present and Proposed Uses of the Compensatory Mitigation Site and All Adjacent Areas (including zoning and long-term protection measures)
6. Reference Site(s) (provide the standards for tracking the progress of the compensatory mitigation project)

IMPLEMENTATION PLAN FOR THE COMPENSATORY MITIGATION SITE
1. Rationale for Expecting Implementation Success
2. Responsible Parties
3. Schedule
4. Site Preparation
5. Planting Plan
6. Irrigation Plan
7. As-Built Conditions (to be certified by a professional engineer and submitted to the Corps within 45 days of fully implementing the compensatory mitigation)

MAINTENANCE ACTIVITIES DURING THE MONITORING PERIOD
1. Maintenance Activities
2. Responsible Parties
3. Schedule

MONITORING PLAN FOR THE COMPENSATORY MITIGATION SITE
1. Performance Standards for Target Dates and Success Criteria
2. Target Functions and Values
3. Target Hydrological Regime
4. Target Jurisdictional and Non-Jurisdictional Acreages to be Established, Restored, Enhanced, and/or Preserved (specify acreages of each type)
5. Monitoring Methods
6. Monitoring Schedule
7. Annual Monitoring Reports (include dates of submission)

COMPLETION OF COMPENSATORY MITIGATION
1. Notification of Completion (written notification is required)
2. Agency Confirmation (the compensatory mitigation is not complete until a Corps LAD Project Manager confirms it is complete during a site inspection).

CONTINGENCY MEASURES
1. Initiating Procedures (describe the circumstances necessitating the initiation of contingency measures)
2. Alternative Locations for Contingency Compensatory Mitigation
3. Funding Mechanism
4. Responsible Parties

3. Once the applicant has developed a **draft** compensatory mitigation and monitoring plan using the items listed above, it should be submitted to the Corps and the state regulatory agencies (i.e., the California Department of Fish and Game or the Arizona Game and Fish Department and the California Regional Water Quality Control Board or Arizona Department of Environmental Quality). The Corps, after coordination with the appropriate resource agencies, will evaluate the **draft** compensatory mitigation and monitoring plan for approval during permit processing. The Corps will generally not issue a permit without a **draft** compensatory mitigation and monitoring plan that has been evaluated and given at least conditional approval. In general, the Corps prefers that the compensatory mitigation site be constructed prior to or concurrently with the project construction. If compensatory mitigation will not be constructed until after project impacts, the Corps will likely increase the replacement ratio, to minimize temporal losses of functions and values associated with project impacts.

D. Compensatory Mitigation Site Construction

1. The applicant will not begin construction until the Corps approves of the **final** compensatory mitigation and monitoring plan. Construction efforts for each individual compensatory mitigation site will be dependent on the size of the site, the type of compensatory mitigation (in general, establishment involves much more work than enhancement of existing habitat), the amount of earthwork required, and the complexity of the compensatory mitigation and monitoring plan. The major effort by the applicant during this phase of the project would be to monitor construction activities and to ensure all aspects of the compensatory mitigation and monitoring plan are completed without incident. This process will normally require on-site management of construction personnel by one or more of the applicant's representatives, who have complete knowledge of the compensatory mitigation and monitoring plan and some understanding of soil science, hydrology, and botany, horticulture, or plant ecology. Sensitive areas should be staked or flagged to preclude unauthorized construction impacts. The applicant is responsible for the successful implementation of the compensatory mitigation, and any significant deviations identified during construction must be approved by the Corps. The most important items that should be monitored include:

a. *Prior removal of exotic plant species during site preparation*. One of the major expenses during the maintenance phase of any compensatory mitigation project will be the continual battle against exotic plant species, as they invade the disturbed habitat. If the construction personnel remove the invasive plant material from the site during the initial grading instead of grading it under, there may be less need for intensive maintenance during later stages of the project.

b. *Monitor the planting strategy to ensure vegetation is not planted in linear rows at a regular distance and that onsite conditions will support the species planted over the long-term*. Many existing compensatory mitigation sites have the appearance of tree farms. These sites lack the complex habitat structure important to support a variety of wildlife and to perform hydrologic, biochemical, and habitat functions optimally. Ensure that plant spacing at the compensatory mitigation site emulates what is observed at regional reference (i.e., high-functioning) sites. In addition, monitor the elevation of the different plant species and confirm that these trees and shrubs are planted at the designed heights relative to the water source supporting them, such as ground water. Confirm the plants are natural members of the surrounding community and not similar ornamental species. Confirm soil conditions (e.g., soil moisture, pH, salinity, organic matter, nitrogen, etc.) are within limits for species being planted.

c. *Monitor the construction activities to ensure habitat outside of the planned compensatory mitigation site is not impacted*. The use of heavy equipment may be needed to construct the site, and care must be taken to ensure that equipment operators do not stray outside of the project boundaries. Brief the operators of heavy equipment on the location of sensitive habitat areas and the importance of avoidance.

2. Once the construction has been completed, provide "As-Built" drawings (preferably in electronic format) to the Corps and other interested resource agencies within **45** days after completion of construction. On these drawings, identify the date the compensatory mitigation site construction was completed and if there were any deviations from the approved compensatory mitigation plan. In addition, it is advisable for the applicant to schedule a compliance visit with the appropriate Project Manager to confirm the site has been planted adequately.

E. Long-Term Compensatory Mitigation Site Maintenance and Monitoring

1. After the site has been graded and planted, the maintenance and monitoring phase of the compensatory mitigation project begins immediately. This phase is crucial to the success of the project, as most compensatory mitigation projects do not develop as expected. Changes in hydrologic conditions, soil conditions, exotic plant species

invasions, disease or pest infestations of vegetation, wildlife browsing, and other problems can occur on newly established compensatory mitigation sites. Without a comprehensive maintenance and monitoring program, many of these minor problems can quickly spiral out of control and threaten the success of the compensatory mitigation site.

As discussed above, one of the most important issues with the maintenance and monitoring of compensatory mitigation sites is the ongoing battle against invasive, non-native (or exotic) plant species. In southern California, there are many invasive, non-native plant species that will readily colonize a recently disturbed site that is being provided with extra water during the late spring and summer. Examination of past compensatory mitigation sites revealed that all sites have been invaded to varying degrees by non-native plant species. Those sites with higher numbers of invasive, exotic species (generally attributable to infrequent eradication) exhibited reduced habitat functions. A proactive program to remove invasive, exotic plants upon discovery would result in higher habitat functions on compensatory mitigation sites. It would also be less costly for the applicant to conduct these removal activities before the density of invasive species becomes a serious problem. Bi-weekly or monthly inspections of the site during the spring and early summer would allow removal of the immature exotic plants before they reproduce and create a much larger problem. In many situations, the site is initially free of exotics, but an adjacent infested property acts as a source of seeds or propagules that continually invade the site. It may be prudent for the applicant to request permission from the adjacent landowner to assist the landowner with removal of the invasive, non-native plant species. In many of these cases, the adjacent landowner simply wants the removed plants to be replaced with a similar plant that performs the same function (e.g., bank stabilization). Although this approach can be costly, it can actually reduce overall maintenance costs, as the level of reinfestation by the particular plant species declines. As the native vegetation becomes established, the threat of invasive plant species is reduced along with the removal effort.

2. The most important aspect of the maintenance and monitoring phase of nearly all compensatory mitigation projects is ensuring the appropriate depth, duration, and timing of water delivery to the site. For riparian compensatory mitigation sites, water availability can be monitored by noting flow in the channel, frequency and level of overbank flooding, length of soil saturation or inundation, and the groundwater levels throughout the year. For these systems, the amount of water and its seasonal availability is important to the type of habitat that is to be restored, enhanced, and/or established. Monthly monitoring (or even bi-weekly) of the site during the first two years would provide important information on site hydrodynamics to determine whether onsite vegetation communities will be stressed or die-off over the long term. It is recommended that the applicant compare hydrologic information at the compensatory mitigation site to reference (i.e., high-functioning) sites in the region.

III. MONITORING REQUIREMENTS

Monitoring reports will be required and identified as a special condition for every permit that requires the construction of a compensatory mitigation site. Written as formal conditions of Corps permits, monitoring reports will be subject to formal compliance efforts. Failure to submit complete and timely monitoring reports could result in suspension of the permit or requirements for additional compensatory mitigation. Non-compliance with Corps permit conditions, which can result in additional compensatory mitigation requirements, may be subject to the Corps' Enforcement Procedures (33 CFR 326).

The requested format, content, and length of the monitoring reports have been significantly changed. The Corps has decided to change the content and reduce the length of monitoring reports to allow the permittee to spend more time on conducting site maintenance and monitoring, instead of wasting resources preparing lengthy reports. While monitoring reports will generally be required on an annual basis, a Corps LAD Project Manager may require more frequent submittals of monitoring reports for specific projects. If a problem is identified within a monitoring report, the appropriate Corps LAD Project Manager can schedule a site visit to determine the extent of the problem and to identify remedial measures. These shorter monitoring reports can then be made part of the official case file leading to improved regulatory documentation of permit compliance and compensatory mitigation success.

The Corps **strongly recommends** that the required monitoring reports be a minimum of six pages and a maximum of eight pages. The following provides an outline of what content should be provided for the specific pages in the monitoring report:

Pages 1-2:

A. Project Information
   1. Project Name
   2. Applicant name, address, and phone number
   3. Consultant name, address, and phone number (for permit application, if necessary)
   4. Corps permit file number
   5. Acres of impact and type(s) of habitat impacted
   6. Date project construction commenced
   7. Location of the project and directions to site (including latitude/longitude or UTM coordinates)
   8. Date of the report and the corresponding permit conditions pertaining to the compensatory mitigation
   9. Amount and information on any required performance bond or surety.

B. Compensatory Mitigation Site Information

   1. Location and directions to the site (including latitude/longitude or UTM coordinates)
   2. Size and type(s) of habitat existing at the site and proposed for restoration, enhancement, establishment (creation), and/or preservation

3. Specific purpose/goals for the compensatory mitigation site
4. Date site construction and planting completed (fully implemented)
5. Dates of previous maintenance and monitoring visits
6. Name, address, and contact number of responsible parties for the site
7. Name, address, and contact number for designer

C. Brief Summary of Remedial Action(s) and Maintenance of the Compensatory Mitigation Site

Page 2 or 3:

A. Map of the compensatory mitigation site
   1. 8 1/2 Diagram of the site including:
      a. Habitat types (as constructed)
      b. Locations of photographic record stations
      c. Landmarks
      d. Inset defining location of the site

Page 3 or 4:

A. List of Corps-approved success criteria

B. Table of results from the monitoring visits versus performance standards for specified target dates

Page 4, 5, and/or 6:

A. Photographic record of the site during most recent monitoring visit at record stations (at least four photos on at least one page, no more than two pages)

Page 5, 6, or 7:

A. Summary of field data taken to determine compliance with performance standards and success criteria (at least one page, no more than two pages)

Page 6, 7, or 8 (if needed):

A. Summary of any significant events that occurred on the site that may affect ultimate compensatory mitigation success

The Corps recognizes there may be cases where this outline would not be practical (for very small, large, or complex compensatory mitigation projects). However, in the majority of cases, this outline should be followed. The Corps LAD Project Manager processing the application can assist the applicant to determine whether deviations from the above outline are appropriate. In all cases, the completed monitoring reports should be submitted unbound to the Corps LAD for inclusion into the official case file. Electronic copies of these reports can be submitted in lieu of written reports and may be required in the future.

IV. COMPLETION OF COMPENSATORY MITIGATION

A. The applicant should notify the Corps in writing when the monitoring period is complete and the Corps-approved success criteria have been met. When applicable, a formal jurisdictional delineation of established wetlands should be submitted with the report (this delineation shall be accompanied by legible copies of all field data sheets). If wetlands are not established, a delineation of non-wetland waters of the U.S. and other areas enhanced, restored, established, or preserved as part of the compensatory mitigation program shall be submitted to the Corps LAD. Following receipt of the final report, the Corps LAD will contact the applicant (or agent) as soon as possible to schedule a site visit to confirm the completion of the compensatory mitigation effort and any jurisdictional delineation. The compensatory mitigation will not be considered complete without an on-site inspection by a Corps LAD Project Manager and written confirmation that approved success criteria have been achieved.

V. CONTINGENCY MEASURES

A brief discussion of the following items shall be part of each annual and the final compensatory mitigation monitoring report, unless the compensatory mitigation site is achieving or has achieved all articulated success criteria:

A. If a performance standard is not met (as identified in the Corps-approved **final** compensatory mitigation and monitoring plan) for all or any portion of the compensatory mitigation project in any year, or if the approved success criteria are not met, the applicant shall prepare an analysis of the cause(s) of failure(s) and, if determined necessary by the Corps LAD, propose remedial actions for approval. If the compensatory mitigation site has not met one or more of the success criteria or performance standards, the responsible party's maintenance and monitoring obligations shall continue until the Corps LAD gives final approval the compensatory mitigation obligations have been satisfied.

B. Alternative Locations for Contingency Compensatory Mitigation. Indicate specific alternative compensatory mitigation locations that may be used in the event that compensatory mitigation cannot be successfully achieved at the intended compensatory mitigation site. Include current ownership information, if offsite.

C. Funding Mechanism. Indicate what funds will be available to pay for planning, implementing, maintaining, and monitoring of any contingency measures that may be required to achieve compensatory mitigation goals.

D. Responsible Parties. List names, addresses, and phone numbers of persons/entities responsible for implementing, maintaining, and monitoring contingency measures.

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APPENDIX A: WETLANDS AND OTHER WATERS OF THE U.S. WITHIN THE LOS ANGELES DISTRICT

A. INTRODUCTION.

The Corps regulates the discharge of dredged or fill material into jurisdictional "waters of the United States," including wetlands. Project-related impacts generally affect the various hydrologic, biogeochemical, and habitat functions that occur within the jurisdictional limits of the site. The functions or processes performed by aquatic habitat can provide or foster the development of characteristics that society values. Compensatory mitigation must replace lost functions and values at the proposed compensatory mitigation sites. The type of wetland or other aquatic habitat that exists at the proposed impact site will be considered in determining the type of compensatory mitigation required; this is not to suggest that "in-kind" compensatory mitigation is necessary in every case. The aquatic habitat discussions provided below are intended to provide the regulated public within the Los Angeles District with some basic information to consider when developing compensatory mitigation for these particular habitat types, whether wetland or non-wetland. They are not meant to be a rigorous treatment of any habitat type, its historic or current distribution, or all the functions and values it provides. This information provides a starting point and some useful points to consider when dealing with the following habitat types:

1. Riparian Habitat

Riparian habitat exists along many stream courses in the Los Angeles District (note that standing water or lentic habitats are separately discussed below). Stream courses in the LAD do not always contain sufficient water to allow jurisdictional wetlands (as defined in USACE, 1987) to form. However, the majority of these streambeds exhibit the physical features of jurisdictional "waters of the United States" (33 CFR 328.3). Many streambeds considered jurisdictional "waters of the U.S." have riparian habitat of one type or another associated with them. Although riparian habitat in the LAD can extend beyond the limits of Corps jurisdiction, much of this habitat receives State protection from either the California Department of Fish and Game or the Arizona Department of Game and Fish. Riparian habitat generally occurs along stream banks where soils are fertile and water is abundant for at least some portion of the year (Faber *et al.*, 1989). The term "riparian" has been defined as:

> "*The riparian zone is the border or banks of a river or stream, or the area influenced by that river or stream. Riparian zones support diverse and abundant terrestrial wildlife species, protect stream banks and adjacent land from erosion, and contribute significantly to aquatic communities by providing shade, cover from predators, nutrients, a buffer from nearby land use activities, and a filter for overland soil erosion.*" *(California Rivers Assessment, 1994).*

The presence of moving water has some very important physical effects on the surrounding habitat in the arid environment of southern California and Arizona. Riparian habitats, especially in the arid southwest, exhibit the majority of the functions and values present in wetland systems (Brinson *et al.*, 1981). Their value to native wildlife in the Pacific Southwest could be greater than previously thought (Brode and

Bury, 1984; Warner and Hendrix, 1985; Knopf *et al*., 1988; Faber *et al*., 1989; U.S. Department of the Interior, 1994). Recent studies have concluded that western riparian habitats could be more important, on an acre-for-acre basis, than wetlands in regions with greater precipitation (U.S. Department of the Interior, 1994). Many of the riparian areas in southern California and Arizona are narrow, linear strips within the more arid habitats of chaparral and sage scrub. Along the coast of southern California, these riparian zones create a complex web of stream channels leading from hilltops down to the ocean and function as wildlife corridors and linear oases with respect to surrounding arid, upland regions (Warner and Hendrix, 1985). Water does not generally flow in these streams year-round, but the presence of groundwater below these riparian strips often allows vegetation to grow throughout the dry Mediterranean summer. The resulting microclimate within these areas provides habitat for species that would not otherwise survive the summer (Brode and Bury, 1984). In general, species diversity is higher in the riparian areas than in neighboring upland areas (Warner and Hendrix, 1985).

Overall, riparian habitats have declined 90-98% in western areas (Warner, 1983; Swift, 1984; Warner and Hendrix, 1985; Faber *et al*., 1989; U.S. Department of the Interior, 1994). In California, approximately 350,000 acres of riparian habitat remained in 1980 (Brinson *et al*., 1981; Swift, 1984). Specific information on the Sacramento River documented a 98% loss of riparian habitat since the 1800's (Swift, 1984). The loss of riparian habitat in the Central Valley has been close to 90%, with only 100,000 acres estimated to remain (Jones and Stokes, 1987). Approximately 49,000 acres of the existing habitat could be categorized as degraded, and the remainder has been impacted to some extent by human activities (Katibah, 1984). Estimates for the loss of riparian habitat in southern California have been complicated by difficulties in aerial photo-interpretation (Faber *et al*., 1989).

2. Lake/Pond Habitat (Source: Cowardin *et al*., 1979, although for simplicity, no distinction has been made in the following discussion between lacustrine and palustrine habitats)

In southern California and Arizona, the climate is not conducive to the creation of permanent lakes with year-round open water. The few natural lakes and ponds within the Los Angeles District that have water throughout the year are generally supported by groundwater seeps or springs. Many of these lakes are shallow and dry up completely in drought years. The majority of the existing lakes and ponds in the region have been created and are supported or maintained by human activities.

While lake and pond habitat often have a similar appearance to riparian habitat along streams, there are notable differences. Many of these differences are attributable to hydrodynamics or the movement of water. Riparian habitat, as defined above, is generally supported by flowing water, while lake/pond habitat is supported by water that is still or is moving slowly. In the Los Angeles District, water typically moves through stream channels quickly and infrequently, resulting in scouring of stream habitat and limited detention. In contrast, lake/pond habitat is generally associated with depressions or dammed river channels where the water is slowed and detained for long periods after the ebb of the flood flows. As a result, many lakes and ponds in the Los Angeles District exhibit a fully expressed transition from an aquatic regime to full upland; with a transition from open water, to emergent herbaceous vegetation, to trees and shrubs, and finally, to upland vegetation. While each zone may not be present at all lakes/ponds, they represent the most common expression of the transition zone. The presence of open water results in a zone of saturated soils, which restricts the establishment of vegetation. The width of this zone is dependent on the slope of the edge and the supply of water. In many cases, the water levels fluctuate throughout the year. Some smaller ponds and lakes will dry up, with larger ponds or those with a perennial water source remaining wet throughout the year. This cycle of open water in the winter and spring and dry mud flats in the late summer and fall are characteristic of lake/pond habitat within the Los Angeles District.

While many lakes and ponds may dry up periodically, there is usually enough water to meet the hydrology parameter of the regulatory definition of a wetland. Those areas where hydric soils and hydrophytic vegetation are also present are regulated as jurisdictional wetlands. In most cases, some portion of a specific lake or pond is jurisdictional wetland. Playa lakes, which tend to occur in desert areas in the Los Angeles District, are notable exceptions; nevertheless, many of these lakes are still considered "waters of the U.S."

The limits of the jurisdictional wetland may extend out of the saturated zone, depending on the slope and fluctuation of the water levels. Because wetlands are common along lakes and ponds, many proposed impacts to lake/pond habitat will be evaluated under the Corps' Standard Permit procedures, which will involve an analysis of alternatives pursuant to the 404(b)(1) Guidelines. In those cases where wetland habitat would be impacted by a non-water dependent activity (e.g., housing), the applicant is required to rebut the presumption that there is a less damaging, practicable alternative that does not impact wetlands or other special aquatic sites.

The limit of Corps jurisdiction within lakes and ponds will generally be the Ordinary High Water Mark (OHWM) associated with the upper limit of winter floods, unless adjacent wetlands are present. In the case of natural and some man-made lakes and ponds, the location of the OHWM will be determined through normal field investigations. For larger lakes and reservoirs, the OHWM can be determined by the average annual water level for the past 20-30 years, depending on the records. If jurisdictional wetland occur adjacent to the OHWM, the Corps' jurisdiction extends to the outer limit of the jurisdictional wetland.

The formation of natural lakes and ponds has been associated with the flooding of existing depressions and the dynamic hydrologic processes within and adjacent to riparian systems. Prior to widespread agricultural and urban development, there was extensive wetland and riparian habitat within southern California. Many of these systems included large areas of low-lying floodplain, some with groundwater seeps or artesian springs. Within in-channel or off-channel depressions, back-water areas, or within areas formed by debris dams, seasonal lakes and ponds formed during and after the winter rains. These lakes and ponds were transitional features for the most part, being formed and destroyed through the natural hydrologic processes that exist along un-constrained river courses. With large-scale agricultural and urban development, many natural processes have been eliminated from the landscape, resulting in the loss of the majority of natural lakes and ponds. However, the development also resulted in the creation of lakes and ponds as water supplies, for flood retention, and for recreation. The habitat surrounding these man-made lakes and ponds is similar to that of natural ponds but without the dynamic hydrologic processes.

Proposed impacts to natural, seasonal ponds and lakes within the Los Angeles District is discouraged because there are so few remaining. As an example, within Orange County, there may be only three natural lakes remaining within the entire county. Preservation of these few remaining systems is a priority of the District, and proposed impacts to them would likely require Standard Permit review. The requirements to rebut the presumption that there is a less damaging practicable alternative will likely be more stringent in the case of proposed impacts to natural ponds and lakes.

Compensatory mitigation required for proposed impacts to lakes and ponds will depend on the location of the proposed lake/pond and the source of water. While it may appear relatively straightforward to excavate a basin, fill it with water, and plant the edges, creation of lakes/ponds and the surrounding edge habitat is more difficult. Issues that must be addressed in the proposed compensatory mitigation plan should include:

- Soil characteristics to ensure there is no excess infiltration
- Quality of the water entering the lake/pond (e.g., no excessive sediment)
- Quantity of water entering the lake/pond
- Overflow outlet with erosion controls
- Sufficient and appropriate buffer habitat
- Maintenance plan, including provisions for sediment-removal and non-native plant species eradication
- Plant palette with appropriate native species

3. Vernal Pool Habitat

Vernal pools, which can occur singly or in complexes, are best defined as seasonally flooded landscape depressions underlain by a subsurface layer (e.g. clay or other impervious soil or rock layer) that limits infiltration of water (Holland, 1976). Vernal pools can usually be distinguished from uplands by a distinct change in vegetation and soil characteristics. Direct precipitation appears to be the primary water source for vernal pools, but overland runoff and groundwater in seasonal perched water tables may also be important (Jokerst, 1990). The impervious substrate of vernal pools is hardpan, claypan, basalt, or other materials that prevent downward percolation of water (Thorne, 1981). These soils and California's Mediterranean climate contribute to the most striking characteristic of vernal pools, which is periodic or continuous ponding during the late fall, winter, and early spring, followed by desiccation during the dry season (Holland, 1976; Zedler, 1987; Holland and Jain, 1988; Jokerst, 1990). Vernal pools support specialized assemblages of flora and fauna, including a relatively large number of federally listed as endangered or threatened species (Cheatham, 1976; Zedler, 1987; Holland and Jain, 1988).

Vernal pools are one of the most, if not the most, endangered wetland habitat types in California's landscape. It has been estimated 97% of the historic vernal pools in southern California have been destroyed. In southern California, few vernal pools remain in urbanized areas. The majority of the remaining vernal pool complexes are found in undeveloped areas. Because they are usually found in flat areas, most remaining vernal pools, which are not already preserved as mitigation for past impacts or through formal reserves, are subject to intense developmental pressure.

Depending on the size of the depression, the amount of rainfall and climate conditions following rainfall, a pool will remain inundated for a week to several months before drying. The period of soil saturation is also variable. Because of the unusual ecological situation created by the drastic seasonal change from wet to dry, only plants and animals especially suited to the ephemeral nature of vernal pools routinely occupy the habitat. Species inhabiting vernal pools must be able to tolerate the wide range of hydrologic conditions and/or complete their life cycles (grow and reproduce) in the short time when the pool provides a suitable environment (Zedler, 1987). Vernal pool biota also varies from year to year in response to the amount and distribution of rainfall (Jokerst, 1990).

While the number of plant species found in a typical vernal pool is low (15-25 species) (Holland, 1976; Taylor, 1992), data suggest that vernal pools support plant species uniquely adapted to the variable hydrologic conditions. The majority of these species are endemic to southern California (Stone 1990), and many have been listed as rare, threatened, or endangered species (Skinner and Pavlik, 1994). Nearly 200 plant species (predominantly annuals) are known to be restricted to, or commonly associated with, vernal pools. Of these, 91% are considered native to California, and 55% have ranges entirely within the state (Holland, 1976). Vernal pools also support a specialized suite of animal species with life histories enabling them to inhabit the highly variable vernal pool ecosystem. Animal species observed in vernal pools include a variety of crustaceans (e.g. fairy shrimp, clam shrimp, and tadpole shrimp) and insects (e.g. beetles and solitary bees). Vernal pools also act as breeding and foraging habitat for many vertebrate species including the more conspicuous spadefoot toads and tiger salamanders. Vernal pools are utilized by migratory wading and shorebirds for resting and foraging, and by mammals as water sources and potential forage sites.

Vernal pools contain highly diverse assembleges of species, because of their size and separation. Each individual pool is similar to an island. Generally, the larger the size of the pool and the shorter the distance to the nearest adjacent pool, the more species that may inhabit it. Vernal pools occurring very close together and appearing very similar can support a very different suite of animals and plants, and the same pool can support different plants and animals in different years due to differences in the pattern and the amount of rainfall. Species can move between pools by waterfowl, shorebirds, and mammals, which can transport dormant seed and eggs from one location or region to another, either internally in food, or attached in mud to their legs or feathers.

A functioning vernal pool ecosystem is complicated, and its viability depends on maintaining more than just the areas that fill with water. Maintenance of a viable vernal pool is dependent on preservation of the surrounding watershed. Most pools are formed through direct precipitation and run off from the immediate watershed. As the surrounding upland habitat is degraded or destroyed, the indirect effects on the decrease or increase in runoff to the pool can have significant impacts. Along with changes to the amount of runoff, modification of the watershed usually results in the addition of pollutants into the pool. Even a small change in a vernal pool's watershed can result in significant impacts to the down-slope pool.

In addition to protection of the immediate watershed, an adequate variety and distribution of pools must be preserved to provide habitat for different vernal pool species, to allow dispersal and re-colonization of vernal pool biota, and to provide habitat during years with different rainfall patterns. As the amount of upland or wetland habitat associated with vernal pools at a site is degraded or destroyed, the viability of the pools and their biota can be impaired due to disruption of hydrology, decreased nesting habitat available for pollinators, decreased summer habitat for amphibians, or decreased attractiveness to waterfowl (dispersers of vernal pool plants and invertebrates).

As a result of the U.S. Supreme Court's January 9, 2001 *SWANCC* decision, many vernal pools may not be within the Corps' jurisdiction pursuant to Section 404 of the Clean Water Act. Many vernal pools are still regulated by the State Water Resources Control Board under their Porter-Cologne authority. Applicants considering or proposing to impact a vernal pool are strongly advised to contact the Corps to determine whether the specific vernal pool proposed for impact is within Corps jurisdiction. The Los Angeles District of the Corps has proposed a regional condition that would require an applicant to obtain a Standard Permit for any impact to a jurisdictional vernal pool. Because jurisdictional vernal pools are considered wetlands, the Standard Permit requirement would require an applicant proposing an activity that is not water-dependent (e.g., housing) to rebut the presumption that a less environmentally damaging, practicable alternative is available to the proposed project. The increased sensitivity of vernal pools will make this requirement more difficult to satisfy in the near future. As a result, the Los Angeles District of the Corps is stressing total avoidance in order to protect the remaining jurisdictional vernal pools. If total avoidance is not practicable, the Corps will require compensatory mitigation, with the first priority being the restoration or enhancement and preservation of other vernal pools on the project site. The objective is to restore or enhance existing vernal pools within the same area. The second priority will be the restoration or enhancement and preservation of vernal pools within the same complex. The third priority will be the restoration or enhancement and preservation of vernal pools in another complex as near as possible to the impact area. In very rare cases, preservation of high functioning and/or highly valuable vernal pools may be accepted as compensatory mitigation for project impacts; but the Corps will set a high mitigation ratio. In general, the creation of vernal pool habitat within off-site areas is not accepted due the difficulty in creating vernal pool habitat.

Because of the ever-increasing scarcity of vernal pools in southern California, it is becoming very difficult and expensive to find compensatory mitigation for unavoidable impacts, especially in urbanized areas where most remaining pools (and their watersheds) are under the greatest developmental pressure. This situation has lead to the destruction of many of the remaining vernal pool complexes, as applicants opt to avoid the regulatory process entirely. The combination of the sensitive nature of the habitat, the scarcity of the remaining pools, and the large number of threatened and endangered species increases the need to avoid any impacts to the remaining vernal pools. Because most vernal pools in southern California support federally listed threatened and endangered species, most proposed impacts also have to be approved by the U.S. Fish and Wildlife Service through the Endangered Species Act's Section 7 or Section 10(a) process.

4. Slope Aquatic Habitat (from PCR Services Corporation, 2000)

Slope wetlands are exceedingly rare in the Los Angeles District, due to their specific formative requirements and the rapid urbanization of the landscape. Slope wetlands are normally found where there is a discharge of ground water to a sloping land surface. Elevation gradients may range from steep to slight and can occur in nearly flat landscapes if ground water discharge is a dominant source to the wetland surface. Principle water sources are usually ground water return flow, interflow from surrounding uplands, and precipitation. Hydrodynamics of slope wetlands are dominated by downslope unidirectional water flow. Water losses are primarily by saturation and subsurface discharge to the soil, surface flows, and by evapotranspiration. Slope wetlands may develop channels, but the channels generally serve only to convey water away from the slope wetland following periods of heavy precipitation. (Brinson *et al.*, 1995). The plant communities in slope wetlands can be emergent or scrub-shrub depending on the hydroregime and soil type.

Using the Cowardin classification system, slope wetlands are considered palustrine systems, which are generally defined as

> "nontidal wetlands dominated by trees, shrubs, persistent or nonpersistent emergents, mosses or lichens, and such wetlands in tidal areas where salinity from ocean-derived salts is below 0.5 ppt. Also included are wetlands that lack vegetation but (1) are less than 8 hectares, (2) lack wave-formed shorelines, (3) have water depths less than 2 meters (6.6 feet) at low water, and (4) have salinity due to ocean derived salts less than 0.5 ppt. Wetlands of the Palustrine System are generally bounded by upland or other classes of aquatic habitats" (Cowardin, 1979)

In central and southern California, palustrine wetlands include habitats and/or biotic communities that have been called freshwater marshes or palustrine emergent wetlands, alkali flats, seeps and springs, and dune swales. Because of the Mediterranean climate of the region, many of these wetlands are characterized by temporary or seasonal flooding, or by seasonally or permanently high water tables with little or no surface flooding.

According to the Ferren classification (Ferren *et al.*, 1996), the slope wetlands in southern California would be generally classified as *Palustrine, Class 50.240, Emergent Wetland* (both persistent and non-persistent), which includes freshwater and alkali marsh types dominated by genera such as *Carex* (sedges), *Eleocharis* (spike-rushes), *Juncus* (rushes), and *Scirpus* (bulrushes). Several of the slope wetlands that are less persistently saturated may be classified as *Class 50.250, Scrub-shrub*. Many of southern

California's slope wetlands fall into one of two Palustrine Hydrogeomorphic Units used in Ferren classification system:

> *(.710) Seeps*, which generally do not have surface flow, are usually seasonally or permanently saturated, and occur in the context of drainage heads, bluffs and slopes;
>
> *(.720) Springs*, which occur similarly to Seeps, but are characterized by the emergence of flowing water for at least part of the year.

All wetlands perform a combination of hydrologic, biochemical, and biologic functions (Brinson *et al*., 1993; Smith *et al*., 1995). The manner and degree to which a specific wetland performs each function varies based on the subclass and location of the wetland. Specific functional assessments typically focus on the subset of the functions that are most likely to be performed by the wetland class being evaluated.

In southern California, eight generic functions are typically performed by slope wetlands. These eight functions consist of two hydrologic functions: Ground Water and Surface Water Interception and Water Retention and Ground Water Discharge; three biochemical functions: Organic Carbon Accumulation and Export, Retention and Release of Elements and Compounds, and Nutrient Cycling/Transformation of Compounds; and three biologic functions: Maintenance of Characteristic Plant Community Composition/Structure, Maintenance of Characteristic Faunal Community Structure, and Maintenance of Regional and Landscape Biodiversity. The identification of these functions is derived from the information discussed in the *Characterization and Functional Assessment of Reference Wetlands in Colorado* (Colorado Geological Survey, 1998) and the draft *National Guidebook for Application of Hydrogeomorphic Assessment in Slope Wetlands* (USACE, unpublished). The HGM guidebooks provide the relevant functions occurring in wetlands nationwide.

5. Salt/Brackish Marsh Habitat

Coastal marshes are generally recognized by biologists and the public as among the most productive and the most impacted habitats in southern California. Despite a dearth of data on past wetland habitat compositions, it is known southern California historically had extensive salt marshes and brackish marshes (Josselyn and Chamberlain, 1993; Zedler, 1996). Southern California salt marshes occupy coastal areas with high salinity (>30 ppt); coastal brackish marshes develop in regions of freshwater and saltwater mixing (0.5-30 ppt) (Zedler, 1984). Southern California salt marshes share certain characteristic features that are worth noting. Generally, the region's salt marshes exhibit a positive slope (1-2%) from the direction of a tidal-flushing water body, with variations in salinity occurring along the elevational gradient (Zedler, 1984). The area between mean sea level and mean lower low water is typically mudflat habitat, which is an area inhabited by diatoms, algae, and a variety of invertebrates (Faber, 1990). The lower marsh zone extends from the upper limit of the mudflat (where the upright herbaceous vegetation is observed) up to the point that is inundated twice a day by high tides. This zone tends to have salt concentrations similar to seawater (~34 ppt), which is generally lower than concentrations in the middle and upper zones. *Spartina foliosa*, less common in southern California than in northern California marshes, tends to dominate the lower-salinity, inundated lower-marsh zone. In contrast, the middle zone, which extends from mean high tide to mean higher high water, favors the growth of more inundation-intolerant species, such as *Salicornia virginica* (Faber, 1990). *Distichlis spicata*, *Frankenia grandifolia*, *Monanthecloe littoralis*, *Salicornia subterminalis*, and *Salicornia virginica* are common residents in the high-zone salt marsh (i.e., extending from mean higher high tide to extreme high tide), which is the driest portion of the salt marsh. Species in this zone tolerate inundation that occurs at a frequency of once or twice a month (Faber, 1990). Sparsely vegetated salt pans typically occur in the highest portions of this zone. Tidal creeks often cut across the various zones, bringing in water with salinity equal to or less than ocean water (Faber, 1990). These creeks develop from minor irregularities in the marsh plain (MEC, 1993). Inundation-tolerant species generally inhabit the tidal creek banks. Overall, southern California salt marsh plant species compositions vary, but the list is restricted to about 20 common species (Zedler, 1982). The species generally occupy the distinct low, middle, and upper marsh zones and are associated with specific habitat types.

In restoring, enhancing, or creating salt marsh habitat, key considerations are elevation, hydrologic regime, and soil. Changes in elevation or hydrology are key considerations because of their effects on wetland vegetation (Zedler, 1982; Josselyn and Buchholz, 1984; PERL, 1990 and 1996). Wetland vegetation abundance, associations, and architecture in turn, determine what wildlife will inhabit a particular wetland (Zedler, 1982; PERL, 1990 and 1996). Soils determine water-percolation rates, provide the growing medium for plants, provide evidence of site-use history, and reveal the extent of groundwater fluctuation. Southern California wetland soils are characteristically fine-grained, with high organic matter and total nitrogen (PERL, 1996). These features have been difficult to emulate in artificial marsh soils, which frequently have had a dredge spoil or upland source (Langis *et al*., 1991; Gibson *et al*., 1994; PERL, 1996). Supplementation with amendments has provided limited success. Apparently, the amendment nutrients leach out or are decomposed too rapidly for long-term stability (Langis *et al*., 1991; Gibson *et al*., 1994; PERL, 1996). Without adequate soil, wetland restoration will achieve limited success at best (PERL, 1996). Therefore, soil must be carefully considered in effecting salt marsh compensatory mitigation.

6. Alkali Aquatic Habitat (from PCR Services Corporation, 2000)

"Persistent, emergent, alkali marsh in a riverine geomorphic setting" or riv-pam wetlands are fairly characteristic of the historic geologic and climatic conditions in California's coastal watersheds. The combination of sedimentary material of marine origin and the inherent geologic instability of coastal southern California are conducive to formation of zones where saline or alkaline water is discharged from fractures in bedrock. The Mediterranean climate and proximity to coastal areas with seed source of alkaline plants allows establishment of alkaline marsh and meadow habitats in canyons with requisite geologic and edaphic conditions.

Historically, riv-pam wetland probably had a fairly wide distribution in cismontane central and southern California (including Baja). As with most wetlands, their occurrence has been reduced by encroachment of urban development into hillside areas. Riv-pam wetlands probably still enjoy a fairly broad distribution, but are likely confined to small, localized populations, each with slightly unique characteristics based on the local conditions in which it exists.

In southern California, the distribution is focused in southern, coastal Orange County, primarily in the Capistrano/Monterey and Sespe/Silverado geologic formations. In Orange County, there are probably fewer than 20 locations where riv-pam wetlands occur. They exist primarily in the San Juan Creek and San Mateo Creek watersheds and in the San Clemente Hydrologic Association. The Orange County riv-pam wetlands can be subclassified into three groups. Segunda Deshecha is in the most common of the three subgroups, which is characterized by intermediate to narrow channel widths, soils characterized by low hydraulic conductivity, thicker hydric and organic soils, and elevated amounts of dissolved ions. Biologically, the diversity of wetland plants is high for sites in this subgroup relative to other subgroups.

Riv-pam wetlands can be expected to provide many of the functions typically associated with mid-order riverine systems, such as Dynamic Surface Water Storage and Removal of Imported Elements and Compounds (Brinson *et al.*, 1995). The persistently saturated conditions and prevalence of emergent marsh communities are conducive to formation of highly-reduced soils and thick soil organic layers. This results in an increased capacity, relative to more mesic or xeric streams, to perform biogeochemical functions, such as Organic Carbon Export and Nutrient Cycling. Geologic and edaphic factors produce alkaline conditions that support plant communities more typically associated with tidal areas, such as *Distichlis spicata*. Consequently, the floral and faunal support functions are somewhat unique relative to ephemeral or intermittent streams.

7. Vegetated Shallow Habitat (Seagrass beds) (Sources: Fonseca *et al.*, 1998; *Southern California Eelgrass Mitigation Policy*, 1991, as amended; Phillips, 1984)

Seagrass ecosystems are protected under federal “no-net-loss” policy for wetlands. Like wetlands, they are recognized as Special Aquatic Sites by the 404(b)(1) Guidelines. Seagrass ecosystems receive this level of protection because they provide many important functions and values.

Seagrass ecosystems are one of the most productive plant communities on the planet. Seagrass meadows form estuarine and marine food webs; they also provide habitat and serve as nursery areas for many marine species. Past large-scale seagrass die-offs have been associated with declines of scallops, fish, clams, crabs, and birds in the die-off areas.

Seagrasses are typically found in shallow, subtidal or intertidal uncolsolidated sediments, but some species occur in the rocky intertidal zone. In addition to their habitat value, seagrasses bind millions of acres of shallow water sediments in coastal waters with their roots and rhizomes while simultaneously baffling waves and currents with their leafy canopy. In this manner, the canopy inhibits resuspension of fine particles and traps water-column-borne material, including nutrients. These nutrients are taken up into plant biomass, which can improve water quality. The physical stability, reduced mixing, and shelter provided by the complex seagrass structure provides the basis for a highly productive and important shoreline ecosystem. Seagrasses occur along all coastal states of the U.S., except Georgia and South Carolina, where growth is discouraged by a combination of high freshwater inflow, high turbidity, and high wave amplitude.

Seagrass habitat can be difficult to define. It can occur as isolated or grouped patches, or in continuous cover beds. Seagrasses also exhibit a variety of growth strategies and coverage patterns, which occur from rocky and soft-bottom intertidal habitats to depths of at least 40 meters. Species such as *Zostera marina* can exist as either perennials or annuals, varying between seed bank and vegetative material depending on time of year; these differences can require very different assessment strategies. Factors compromising the accuracy of one-time surveys include bed-form migration, presence of seed banks, annual populations, recent non-point source anthropogenic impacts (e.g., decreased water clarity), and direct removal of seagrasses. Therefore, one-time inventories are generally inadequate. Because seagrass beds move over time, unvegetated areas between seagrass bed patches are candidates for future colonization. Therefore, effective seagrass management considers vegetated beds as well as any unvegetated areas between seagrass bed patches.

Because of their location in the coastal zone, seagrasses are particularly susceptible to human activity. There is a clear correlation between human development of the shoreline and seagrass decline. Seagrasses are particularly susceptible to nutrient loading (e.g., accelerates growth of light-absorbing algae, which decreases light available to seagrasses), light reduction (e.g., increased turbidity, shading), and mechanical impacts (e.g., propeller scarring, pile driving, dredging, filling). While mortality can happen in weeks or months, recruitment does not typically keep pace. The rate of recovery rates depends on whether seed set and germination can occur (i.e., 1-2 growing seasons) or whether only vegetative encroachment occurs (i.e., can take several years).

Before recovery efforts are initiated at an impacted site, it is important to determine whether the factors leading to the loss of seagrass still occur or are likely to occur. For example, if water quality is believed to be the reason for loss, either the water quality at the site must be improved or an alternative site must be identified for seagrass recovery.

Many seagrass planting techniques have been developed since the 1970s. While it is still not clear what factors are the most important to address to ensure planting success, some guidelines have emerged. Elevation in the tidal zone, current speed, salinity, sediment type (sandy, combination, cohesive), and seagrass species are important factors. In addition, seagrasses should not be planted in areas where there is no prior history of their existence. For information regarding seagrass planting and transplantation methods, maintenance, and monitoring in southern California, refer to the *Southern California Eelgrass Mitigation Policy*, dated 1991, as amended (http://swr.ucsd.edu/hcd/eelpol.htm).